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EXAMINER	
LOKE, S	
ART UNIT	PAPER NUMBER
258	9

DATE MAILED:

06/06/89

This is a communication from the examiner in charge of your application.

COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☒ Responsive to communication filed on 2/2/88 ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), ~~6~~ from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- ☒ Notice of References Cited by Examiner, PTO-892.
- ☐ Notice re Patent Drawing, PTO-948.
- ☐ Notice of Art Cited by Applicant, PTO-1449
- ☐ Notice of informal Patent Application, Form PTO-152
- ☐ Information on How to Effect Drawing Changes, PTO-1474
- ☐

Part II SUMMARY OF ACTION

- ☒ Claims 1-22 are pending in the application.
Of the above, claims _____ are withdrawn from consideration.
- ☐ Claims _____ have been cancelled.
- ☐ Claims _____ are allowed.
- ☒ Claims 1-22 are rejected.
- ☐ Claims _____ are objected to.
- ☒ Claims 5-7, 10, 13 are subject to restriction or election requirement.
- ☐ This application has been filed with informal drawings which are acceptable for examination purposes until such time as allowable subject matter is indicated.
- ☐ Allowable subject matter having been indicated, formal drawings are required in response to this Office action.
- ☐ The corrected or substitute drawings have been received on _____. These drawings are ☐ acceptable;
☐ not acceptable (see explanation).
- ☐ The ☐ proposed drawing correction and/or the ☐ proposed additional or substitute sheet(s) of drawings, filed on _____ has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).
- ☐ The proposed drawing correction, filed _____, has been ☐ approved. ☐ disapproved (see explanation). However, the Patent and Trademark Office no longer makes drawing changes. It is now applicant's responsibility to ensure that the drawings are corrected. Corrections MUST be effected in accordance with the instructions set forth on the attached letter "INFORMATION ON HOW TO EFFECT DRAWING CHANGES", PTO-1474.
- ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received ☐ not been received
☐ been filed in parent application, serial no. _____; filed on _____.
- ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
- ☐ Other

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Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 22 talks about the said conductor structure of claim 21 composed of two layers. However, which conductor structure it refers to, upper or lower? At this point, the applicant is unclear.

Claims 5-7, 10, 13 are rejected under 35 USC 112, fourth paragraph, as being of improper dependent form for failing to further limit the subject matter of claims 1 and 4. The main objective claims 5-7, 10, 13 are about the process to manufacture a metal plating layer while they do not show any new structural improvement or new material composition for the claimed device.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless-

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent.

Claims 1-6, 7, 10, 13, and 20 are rejected under 35 U.S.C. 102a as being clearly anticipated by McDavid.

The McDavid reference shows a metal gate and contact, interconnect system for MOS VLSI device containing the following elements:

- a gate wiring [11].

- a substrate having a doped semiconductor region

[10].

- a lower conductor structure [30].
- an insulating layer [31] overlying lower conductor structure and it has at least 1 opening extend to lower conducting structure.
- an upper structure has at least a layer of metal or metal alloy and a metal layer on and adhering to that layer.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless-

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent.

Claim 21 is rejected under 35 U.S.C. 102a as being clearly anticipated by Sasaki.

Sasaki discloses a new device interconnection for VLSI comprising:

- a substrate having a doped semiconductor region [1].
- a gate wiring [G].
- a lower conductor structure [10b].
- an insulating layer [12a] overlying the lower conductor structure [10b] and it has at least 1 opening [12b] extend to lower conducting structure.
- the upper conductor and lower conductor is connected through the opening [12b].
- an upper structure comprising:
 - 1 metal plating layer [12b] formed in the

said opening.

- a conductor structure [14b] formed on the metal plating layer [12b] and the insulating layer [14a].

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Claims 8, 9 are rejected under 35 U.S.C. 103 as being unpatentable over McDavid in view of Howard.

Howard discloses a metal plating layer composed of at least two alloy plating layers, a metal nitride layer and an aluminum-copper layer. It also discloses a metal plating layer composed of a single metal and an alloy plating layer, Au and metal nitride. McDavid discloses a metal plating layer composed of Au and Tungsten. McDavid differs from the claimed invention because he uses two layers of pure metal. Howard is evidence that the person of ordinary skill in the art recognizes the

benefit to use two alloy plating layers and a single metal with an alloy plating layers. Since both McDavid and Howard are directed analogous VLSI device, it would be obvious to use the plating layers of Howard in place of McDavid.

Claim 11 is rejected under 35 U.S.C. 103 as being unpatentable over McDavid in view of Baudrant et al.

McDavid discloses a semiconductor region of an impurity doped Si polycrystalline. Baudrant discloses a semiconductor region which is an impurity doped Si monocrystalline region. McDavid differs from the claimed invention because he has a polycrystalline region. It would be obvious for one skill in the art to use Baudrant's monocrystalline Si in the semiconductor device of McDavid.

Claim 17 is rejected under 35 U.S.C. 103 as being unpatentable over McDavid in view of Sasaki.

McDavid discloses the wire gate is composed of Tungsten and the lower conductor use Tungsten-silicide. Sasaki discloses the wire gate and lower conductor composed of Al. McDavid differs from the claimed invention because he uses Tungsten for wire gate and Tungsten silicide for lower conductor. Sasaki is evidence that ordinary workers who are skilled in the art recognize the benefit using Al for the wire gate and for the lower conductor. Since Sasaki use Al for the wire gate and lower conductor, it would be obvious for one skilled in the art to use the composed material of Sasaki in the device of McDavid.

Claim 15 is rejected under 35 U.S.C. 103 as being unpatentable over McDavid in view of Sasaki, further in view of Brasen et al.

Brasen discloses a metal plating layer [13] and [113]. Brasen is evidence that ordinary workers who skill in the art of metal plating layer recognize the benefit of using plurality of superposed layers of different material. Since Brasen has a plurality of superposed layers of different materials, it would obvious for one skilled in the art to have more than one metal plating layer as taught by Brasen.

Claim 16 is rejected under 35 U.S.C. 103 as being unpatentable over McDavid in view of Sasaki, further in view of Howard.

Howard discloses a metal plating layer is composed of alloy material. Howard is evidence that ordinary workers who skill in the art of metal plating recognize the benefit of using alloy. Since Howard is using metal-nitrides, it would obvious for one skilled in the art to have alloy as metal plating layer as taught by Howard.

Claim 14 is rejected under 35 U.S.C. 103 as being unpatentable over McDavid in view of Brasen.

Brasen discloses a metal layer [13] connects to gate wiring [9], lower conductor structure [111], [112] and [113] and the upper conductor structure [15]. Brasen is evidence that ordinary workers who skill in the art of device structure recognize the benefit of

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using the above structure. Since Brasen is using the above structure, it would be obvious for one skilled in the art to use the structure taught by Brasen.

Claims 18-19 are rejected under 35 U.S.C. 103 as being unpatentable over McDavid in view of Brasen.

Brasen discloses a metal plating layer [13] deposited on the gate wiring [9] and the lower conductor structure [111], [112], [113]. Brasen is evidence that ordinary workers who skill in the art of metal plating recognize the benefit to have the above structure plated. Since Brasen has the gate and lower conductive structures plated, it would be obvious for one skilled in the art to have the structure taught by Brasen.

Claim 12 is rejected under 35 U.S.C. 103 as being unpatentable over McDavid in view of Sasaki.

Sasaki discloses a metal plating layer [12b] is disposed within the opening between upper [14b] and lower [12b] conductor structure.

Sasaki is evidence that ordinary workers who skill in the art of semiconductor structure recognize the benefit of the described structure. Since Sasaki has the described structure, it would be obvious for one skilled in the art to have the structure taught by Sasaki.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Loke whose telephone number is (703) 557-4815.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 557-3311.

Loke/Km

5/25/89

S.L.

Rolf Hille
ROLF HILLE
SUPERVISORY PATENT EXAMINER
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